TOURISM CARRYING CAPACITY TOWARD SUSTAINABLE TOURISM DEVELOPMENT: A CASE STUDY OF PHUKET WORLD CLASS DESTINATION

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Abstract

This study aims to seek a deeper understanding of tourism carrying capacity and tourism impacts in the case of a world-class travel destination such as Phuket, Thailand. A mixed-methods approach, combining qualitative and quantitative data collection, was adopted. 800 copies of the questionnaire were distributed to tourists in Phuket in order to measure the general tourism situation in Phuket and to investigate tourist satisfaction toward various tourism products and services. In-depth interviews were also conducted with both local Phuketians and local government members to explore Phuket tourism issues. It was found that tourism carrying capacity regarding the exploitation of resources (physical, environmental, social, and economic exploitation) exceeds the carrying capacity. Furthermore, it was determined that the recreation capacity of facilities poses a huge threat towards tourism. Several beaches in Phuket including Kamala and Rawai also welcomed a larger number of tourists than their physical carrying capacity. Moreover, results indicated a high cost of living in Phuket. The results have both theoretical and practical implications for sustainable tourism development in Phuket; the government sector, private sector, and public sector should make adjustments in their management direction as a first priority, in order to achieve the best response to the current needs of the people without diminishing the ability of people in the next generation to achieve their needs.

Keywords: Tourism Carrying Capacity, world- class destination, Phuket Province

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INTRODUCTION

According to the report on tourism in the economic and social dimensions conducted by the World Tourism Organization (United World Tourism Organization/UNWTO, 1981), revenue generated by tourism will be key to driving economic growth, along with the increasing number of jobs in the tourism sector, services, and related businesses. Tourism also supports investment, employment, infrastructure, and transportation development, distributing significant income at the local level (Turner, 2015, 1; Khan, Bibi, Lorenzo, Lyu & Babar, 2020; Rodrigue, 2020). For developing countries, several emerging tourist destinations have been proposed and developed (National Economic and Social Development Board, 2015, p.3). Thailand is forecasted to have 67 million foreign tourists in the next 15 years. Nevertheless, this forecast is based on the trend and assumption that the Thai tourism situation will remain normal without negative events or crises causing direct and indirect effects on the Thai tourism industry. In this case, the mainstream target market will be stable, but Chinese tourists will have a greater proportion.

Although natural tourism management tends to grow significantly in physical tourism, some areas are not well managed, and management may not be consistent with the amount of natural resource available, especially during high

seasons, holidays, or weekends (Dachanee Emphandhu, Sutas Wattanalert, & Renuka Ruschano, 2004). The increasing number of tourists beyond the capacity threshold in these areas has caused several problems in natural resource management, e.g. tourist congestion and facility inadequacy. Furthermore, a number of recreational activities introduced to facilitate tourists may also lead to the degradation of natural resources. These issues can cause tourist dissatisfaction, negatively affecting Thailand's tourism in the long run.

This research is based on the hypothesis that the existing tourism carrying capacity of Phuket tourist destinations is inadequate against the excessive exploitation of resources, such that effective management approaches are required for Phuket tourist destinations to be competitive among world-class tourist destinations. Consequently, this research emphasizes the concept of carrying capacity in relation to the four dimensions of tourism exploitation (i.e., physical, environmental, social, and economic). The study of tourism direction in Phuket and tourism opportunities in relation to tourism carrying capacity indicates that Phuket is one of the best locations for investment in tourism. It has the potential to become a holistic tourism hub due to the fact that it has a geographical competitive edge.

Thus, this research assesses tourism carrying capacity (TCC) and its impacts concerning tourism exploitation in Phuket. A proper solution for Phuket to be widely recognized among world-class tourist destinations is also proposed in accordance with the long-term management and tourism development plan for the country over the next 20 years (2017-2036), the National Economic and Social Development Plan, volume 12, (2017-2021), and the National Tourism Development Plan, volume 2, (2017-2021) to meet tourist satisfaction on the one hand, and for the host destination to increase economic opportunity, and opportunities to enhance future quality of life on the other.

LITERATURE REVIEWS

Phuket, an island with an area of 543.034 square kilometers, is one of the southern provinces of Thailand. Phuket's territory also covers 39 smaller islands located to the south-west of Thailand in the Andaman Sea. According to Thailand Official Statistics Registration (Official Statistics Registration Systems, 2019), the total population of Phuket is 416,582. Travelers can easily access Phuket's tourist attractions due to linking transportation routes from within Thailand and abroad. For the Andaman coastal provinces, Phuket has the highest number of visiting tourists, at 14,065,991 visitors in a single year (Phuket Tourism and Sports Office, 2019). Many beautiful, natural attractions and recreational activities in Phuket

have brought not only income distribution and jobs to the locals, but also economic growth in Thailand.

The concept of carrying capacity (CC) was introduced in biology to define the level of a species' population attaining the environmental resistance indigenous to its location. Lime & Stankey (1971) defined CC as a character of use that can be supported over a specified period by a developed area at a certain level without causing excessive damage to the physical environment, quality of life, or visitor experience.

The United World Tourism Organization (1981, 4) defines carrying capacity as "the maximum number of people that may visit a tourist destination at the same time, without causing destruction to the physical, economic, or sociocultural environment and an unacceptable decrease in the quality of visitor satisfaction", which is consistent with Schneider (1978, 281), who also defined CC as the ability of the natural or artificial system to absorb the population growth or physical development without significant degradation or damage. CC can be interpreted in the tourism context as the maximum number of tourists that can be accommodated by the existing destination resources

Figure 1. *Phuket Island Map*
From *Phuket Island Map*, by S. Audinger, 2020.
Retrieved from http://mapsof.net/_ phuket/ phuket-island

without causing environmental degradation or damage.

"Tourism destinations are complex and evolutionary systems that need to be well organized in order to improve their overall management, which includes both objective (e.g. availability of resources) and subjective variables (e.g. tourist and local community perceptions)" (Bimonte & Punzo, 2005; McCool & Lime, 2001). As such, the definition of the maximum number of tourists capable of visiting the destination without causing permanent damage should involve the possibility to limit access to the destination.

Nevertheless, this definition is only applicable to a few kinds of places, e.g., nature reserves and historical sites. Otherwise, it would remain only a theoretical exercise without operational meaning (Hof & Lime, 1997). The impacts caused by tourism activities are dependent upon not only the number of tourists visiting the area but also the tourists' behavior and the local characteristics provided (Ioannides & Billing, 2005; Wagar, 1974). There is no unique carrying capacity for a tourist destination, but multiple carrying capacities can be determined from the natural and physical resources available, the management system characteristics, the tourism types, and the stakeholders' perceptions, as well as other local conditions (Ioannides & Billing, 2005; Butler, 2011). Therefore, there are some authors (Lindberg, McCool & Stankey, 1997; McCool & Lime, 2001), who have proposed a shift from the question "How many is too many" to "How much change from natural conditions is acceptable given the goals and objectives of the area", starting from the limit of acceptable change (LAC) (Stankey & Cole, 1985). This approach suggests the TCC assessment method as a framework comprising a set of standards provided with acceptable changes in a quantitative manner, not just as a scheme aimed at obtaining a unique value (Ahn, Lee & Shafer, 2002).

There is no simple measure of carrying capacity that can be evenly and equally applied to all destinations and attractions as they are not homogeneous in their morphology and structure (Kennell, 2016). Tourism destination development must consider each type of tourist destination (Coccossis, Mexa & Collovini, 2002), for example coastal areas, islands, protected areas, rural areas, mountain resorts, or historical settlements and towns. As Khan, Bibi, Lorenzo, Lyu & Babar (2020) have noted, 'Tourism has great potential to speed up progress across the economic sectors in a sustainable manner', thus the definition-assessment and implementation of TCC needs to be considered as a process within the planning process of tourism development. These two processes are parallel and complementary and can provide a general framework guiding the local community, planners, and decision-makers.

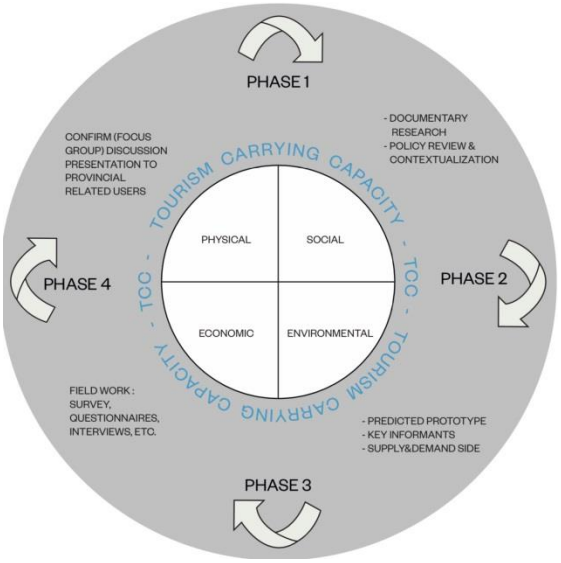

Figure 2. *Conceptual Framework*

CONCEPTION FRAMEWORK

This study focused on the tourism carrying capacity and tourism impacts in relation to tourism exploitation and the solution to manage destination development properly so that it leads to prosperity, making Phuket Province 'A world-class tourist destination' that will be benefited by development and any changes in the near future as shown in Figure 2.

METHODOLOGY

The research consists of certain methodological steps commencing from participants identification to data analysis as follows:

1. Participants Identification

The study was conducted from March to September 2016 on tourist beach destinations in Phuket, located outside reserved forests under the national laws: beaches such as Patong, Kata-Karon, Rawai, Naihan, Kamala, and Bangtao. The population in this research consisted of stakeholders (e.g., from governmental sectors, communities leaders, private sectors-especially in hospitality industries, public sectors, and local people, as well as Thai and foreign visitors in the target areas) located in Phuket's tourist areas who were involved in a real situation with interest in tourism and tourism management in the tourist areas.

2. Data Gathering

Since this research aims to study the relationship between TCC and tourism exploitation to develop an effective model for Phuket tourist destinations, primary data, and

secondary data are two main sources for this research. Four different research methods were utilized to gather tangible information: 1) A general survey generating an overview of tourism's physical, economic, marketing, and social aspects, national tourism policies, the current tourist situation, and visual impact analysis of scenic points (VIA), was conducted in 34 locations of Phuket tourist destinations in Phuket Province. 2) In-depth interviews were conducted with locals and government officials (68 participants) on issues related to tourism in Phuket Province 3) Questionnaires (800 questionnaires) were distributed to tourists to ascertain customers' satisfaction with various tourism products and services. Questionnaires were also distributed in Phuket Province with an aim of finding out peoples' opinions regarding sewage management, particularly regarding how well they think about the government and the public garbage management. 4) An operational meeting was also held in order to provide an opportunity for every relevant individual from every sector to voice their opinion; this included approximately 50 participants, and regarded the tourism development plan, the problems relating to it, and the impacts gained from it.

There are also several types of secondary data that were examined in addition to the information provided by the primary data. The secondary data includes the available data collected by different sources (e.g. maps, satellite photos, and published information). Secondary data also includes administrative data collected routinely as part of the day-to-day operations of Phuket tourism organizations and agencies. They include information from the regional population and Phuket government information collected over a long period, allowing the detection of changes over time. In this case, the secondary data in this research is classified into: 1) tourism information of Phuket and other Andaman provinces (physical, economic, and social tourism, overall marketing, travel policy, and the tourist situation; 2) TCC assessment information (physical, environmental, social, and economic factors); and 3) tourism management information of the tourist area (the provincial strategic planning and land-use planning). The collected data was identified and synthesized to establish a conceptual framework as a baseline for tourism capacity assessment.

3. Instrument Identification

The questionnaire contained question items related to tourists' satisfaction with tourism products and services, as well as tourists' opinions regarding solid waste management and the public management of garbage in the designated tourist spots. The questionnaire was consulted with at least three experts to check and

evaluate the validity and the reliability of the questionnaire's structure. The content validity of the structured questionnaire was analyzed and synthesized using the Item Objective Congruence Index (0.60-1.00). The questionnaire was pretested on a sample of 30 tourists, regarding their satisfaction with solid waste management generating an alpha coefficient of 0.717. In each episode of the tourist satisfaction survey, the Cronbach's alpha coefficient was 0.840, showing the reliability of this questionnaire was at a good level (Siriphong Pruetthipan, 2008, 142).

The criteria for assessing each competency are based on two components: 1) the type and level of impact from tourism activities related to the quantity and nature of the utilization (Dachanee Emphandhu, Sutas Wattanalert & Renuka Ruschano, 2004), and 2) the area's management objectives, used to determine the factors and criteria appropriate for such an area, which are consistent with the environment, culture, and travel experiences. In this case, each of the criteria must be considered together under Liebig's law in a condition of the highest level of crisis capacity support as an indicator of the highest level of tourism carrying capacity (Noppawan Tanakanjana Phongkhieo, Surachet Chettamart, Dachanee Emphandhu, Nath Pitchakum, Somkiat Singhavorawut, Lek Termtrakul & Siripong Rachkiri, 1998).

Table 1. *TCC evaluation criteria*

Exploitation Level	Impact Level
Lower than the Carrying Capacity Level (Below)	Some or None (Low or No concern)
Near the Carrying Capacity Level (Approach)	Quite critical (High concern)
Over the Carrying Capacity Level (Exceed)	Crisis (Extreme concern)

Note. Adapted from *The Limits of Acceptable Change (LAC) System for Wilderness Planning, by* G. H. Stankey, D. N. Cole, R. C. Lucas, M. E. Petersen, and S. S. Frissell, 1985, Forest Service, United States Department of Agriculture. and *Recreational Areas Management; Guideline, by* Dachanee Emphandhu, Sutas Wattanalert, & Renuka Ruschano, 2004, Bangkok: Tourism Authority of Thailand.

4. Data Analysis

The data obtained from the different research methods was statistically analyzed using frequency, percentage, arithmetic means, and standard deviation to evaluate the TCC using the impacts assessment criteria of UNWTO (1981), including the physical, social, environmental, and economic aspects concerning tourism exploitation. The tourism potential of Phuket was analyzed from the collected data and presented in a formal report format containing guidelines for proper management of tourism development and guidelines for connecting tourism between Phuket and other Andaman provinces.

While the quantitative data were analyzed using a computer program for descriptive statistics, and data analysis for measuring the frequency distribution and mean ($\overline{x}$) (Wacharaporn Suriyapiwat, 2010, 128-130; Kulya Vanichbancha, 2011), the qualitative analysis was based on well-respected evaluation criteria. For example, in the 27th National Environment Board Announcement, 2006, Category 4 (Royal Thai Government Gazette, 2007), the Standard Method for the Examination of Water and Wastewater, APHA, AWWA, WEF, 22nd Edition 2012, was used as a guideline for an analysis of marine and coastal water quality standards. The analysis of visual quality, including visual pollution and visual impacts was performed through a survey of resident attitudes and expert evaluation criteria for the Seen Area Analysis or Visual Impact Analysis (VIA) Technique. It should be noted that the World Tourism Organization (UNWTO, 1981), Castellani & Serenella (2012), Department of National Parks, Wildlife and Plant Conservation (2006), Department of Tourism (2014), and the Urban Comprehensive Plan Standards 2006 of the Department of Public Works and Town & Country Planning (2006), were used as the evaluation criteria body to analyze and assess the feasibility, the quality standard of tourist attractions, the density of people per unit of beach area, and impact level. Similarities and differences of collected data were classified and grouped to find their relationships using descriptive analysis. The data was also validated with the researchers' responsibility and ethics considered as key principles for the integrity of the research. Information gathered from the comments and suggestions, conditions, problems, obstacles, and needs, of the interested parties from two workshops (in Phuket area) was recorded for further analysis. Results from the data analysis were taken (from workshop sessions, data included analysis from surveys, record forms, interview forms, and questionnaires) to analyze the tourism carrying capacity and the impact of tourism related to the feasibility and impact level with analytical models.

RESULTS AND DISCUSSION

The results of the evaluation of the TCC in Phuket's tourist area (physical, environmental, social, and economic exploitation) are represented in Table 1. The results indicate that TCC concerning the exploitation of resources in terms of physical, environmental, social, and economic exploitations exceeds the provincial carrying capacity. In other words, the results represent excessive tourism development, posing an extreme concern, because it exceeds the limit of acceptable change (LAC). This means the environment is transformed and the irrigation is imbalanced, causing demand and supply of water to move out of equilibrium. The locals have negative attitudes towards the tourism development proposed by the government, which has led to dissatisfaction towards the current national economy in which the living cost is high, but the locals do not have higher revenue. Moreover, the revenue of the tourism industry is clustered within certain groups of people where participation from locals is limited or ignored. Furthermore, the invasion of foreign workers also contributes to the negative attitudes of locals towards tourism since the number of foreign workers in Phuket has been increasing. Department of Tourism, and the Ministry of Tourism & Sports, (Toilets and Tourist service centers) exceed the TCC or are posing a significant threat to Phuket tourism. Besides this, the quality assessment results of tourist beaches indicated that tourism development in Kamala beach and Rawai beach has exceeded the physical carrying capacity, posing a significant threat to the beach environment. The results also imply that the excessive tourism development can be considered as a key factor affecting tourism management.

Table 2. *Tourism Impacts Assessment*

TCC Assessment Criteria	Tourism impact Level
1. Physical Impact	**Exceeding**
2. Environmental Impact	**Exceeding**
3. Social Impact	**Below**
4. Economic Impact	**Approaching**
Summary	**Exceeding**

Table 3. *TCC of recreational activities in Phuket targeted tourist beaches.*

Quality Assessment Criteria	Tourism Impact Level
1. The basic Support Facilities.	**Exceeding**
2. The quality assessment for beach destinations.	**Exceeding**
3. The potential in destination management	**Exceeding**
Summary	**Exceeding**

The results of the tourism opportunity exploitation and its impact in Phuket are represented in Figure 2. From the tourist destination life cycle, there exists a tourism development path for Phuket from the fourth stage (the consolidation stage) to the development of the fifth stage (the stagnation or fatigue stage). Although, the tourism sector is important in generating revenue for provinces and countries, from direct and indirect employment in the tourism industry, the growth of tourism may not be sustainable due to many external and internal risks. As such, tourism opportunities in relation to the exploitation of resources can be implied from the level of demand. To illustrate this point, if there exists a decrease in demand, there has been a continuous use of resources exceeding the TCC. In the meantime, the use of resources can still be handled within the TCC if there is an increase in demand. Nevertheless, the supply trend is likely to retreat, along with the tourism economy for, at least, five years if the public sector forcibly increases the demand to reach a desirable equilibrium. For the second context, however, the crisis management plan must be well prepared by the public sector. The retreat prediction can also change if there is an unexpected external factor affecting it.

The results based on the analysis of Strengths, Weakness, Opportunities, Threats (SWOT), and limitations indicate that several tourist destinations in Phuket can be considered as world-class tourist destinations. However, there is an imbalance between the demand and supply of tourism as well as the tourist structure and the price competition. Foreign tourists spend less on accommodation, but increase spending on food and beverages. The laws related to the tourism industry are not strictly enforced, and the laws on tourism as a breach have evaded legal practice and self-interest for profit. There is a higher cost of living in comparison with other provinces. Despite the fact that a number of

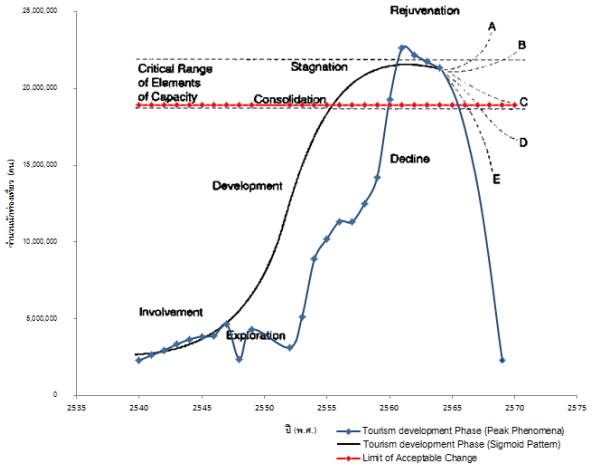

Figure 3. *The limits of acceptable change related to tourism exploitation* Adapted from "Tourism Area Life Cycle," by R.W. Butler, 2011, *Contemporary Tourism Reviews*. Retrieved from https://www.goodfellowpublishers.com/free_ files/ Contemporary-Tourism-Review-TALC-fa9aef4da56046336b1eef4ef113debc.pdf

supportive facilities in most tourist areas are sufficient for tourists, some tourist destinations in Phuket are being degraded and are exceeding their capacity. Furthermore, there is no efficient mass transit such as a jetty, or rail system. Land use is not effective and water consumption is imbalanced. In addition, the water supplied is inadequate for consumption in some areas. There is a lack of integration of environmental programs at the provincial level. The local community lacks the ability to contribute to decision-making in tourism management. The community also lacks awareness regarding conservation and respect for the rules of society. Despite the increasing number of tourists, the average number of days that tourists stay in Phuket has decreased. Primarily, there are many foreigners in Phuket. While some of them stay as workers in the tourism industry, some focus on their self-interests by establishing tourism businesses in Phuket, which are not desirable for Phuket's tourism industry in the long term.

The physical, environmental, social, and economic impacts of tourism are a consequence of the government's tourism support policy and the relevant strategic and legislative requirements on land use, along with the conservation of environmental resources. The result of land use in Phuket is an urban sprawl characterized by the spread of infinite scattered areas. If there is serious law enforcement on environmental management, which can systematically be monitored, evaluated, and reviewed for continuous improvement, several

issues, such as garbage, solid waste, drinking water, and energy consumption can be addressed in a manageable condition. The results are consistent with stakeholder opinions in the Phuket community where there is a shortage of water and some entrepreneurs conceal the property infrastructure. The results are coherent with the studies of Badaruddin & Tay (2016), which state that "the degree to which a protected island can sustain a viable tourism and recreation presence, is dependent on the physical environment, the behavior of visitors, and most importantly its management and resourcing. Without appropriate management, regardless of how beautiful an island is, eventually it will lose its nimbus". These results are consistent with the research of Saveriades (2000), who claimed that the TCC of a destination is determined by its ability to absorb tourist development before negative impacts are perceived by the host community. In addition, the author further emphasized that "the level of tourist development beyond which tourist flows will decline, because the destination area ceases to satisfy and attract them".

CONCLUSIONS AND RECOMMENDATIONS

The figures show that between 1998 and 2017 the density of tourists on Phuket Island increased 18 percent so the pressures of tourism development on the destination has rapidly grown, causing an increasing demand for public services, such as water, electricity supply, sewerage, etc. especially during the high season period. The number of visitors is much more than the residents. As such, the size of the provincial economy is strongly dependent upon tourism. Tourism causes physical, environmental, social, and economic impacts, and the extent of tourists' use of resources has exceeded the level of the provincial carrying capacity. According to Marion & Cole (1996) and Bertocchi, Camatti, Giove, & de Borg (2020), the amount of impact varies with the amount of land use and the nature of the landscape. As tourism flows are significantly growing, the rate of environmental hazards is also increasing and appropriate approaches for sustainable tourism must be implemented (Zacarias, Williams, & Newton, 2011; Widz & Wójcik, 2020). Therefore, any malpractice in tourism management can cause a chain reaction influencing other parts of the system. According to the analysis of the Phuket tourism cycle, the increasing number of tourists in tourist areas is inconsistent, since the number relies on both internal and external factors affecting the tourists' decision making regarding their tourism destinations. Although, the analysis of Phuket's tourism cycle may not provide an explicit path for sustainable tourism, it represents transformations occurring in Phuket tourism.

The conspicuous growth of Phuket in several dimensions (e.g., inhabitants, lodgings, infrastructure and equipment) is not always beneficial to the Phuket tourism industry. For instance, exceeding the TCC thresholds of the carrying capacity implies the environmental, social, and economic deterioration of tourist destinations. Therefore, the new policy and the proper tourism management direction should be prioritized to develop tourism potential, urban design, new land use patterns, and other economic activities, without affecting the province in terms of physical characteristics, environment, society, culture, and economy. Primarily, the proper management will improve the quality of life of the local people who live in tourist areas (Wang, Huang, Gong & Cao, 2019). For sustainable tourism development in Phuket, the following recommendations should be implemented as soon as possible:

1. The tourist areas in Phuket should be promoted and carefully planned in accordance with the direction of urban development, that is, the capacity of tourist attractions to accommodate the volume of tourists. Strategic options for competitive advantages must be established to reduce the impact of tourism on various aspects such as the governmental sector, private sector, and public sector, which should make adjustments of their management direction a first priority in order to develop the tourism industry of the Province, and should integrate the tourism industry and other industries in the supply chain according to the concept of sustainable development, responding to the current needs of the people without diminishing the ability of people of the next generation to achieve their needs (World Commission on Environment and Development, 1987; Eber, 1992).

2. Phuket has recently been promoted by the government to be one of two leading smart cities. This will entail the adoption of digital technologies and innovations to provide useful information for tourists and automation in the tourism industry. The adoption of digital technologies and innovations for Phuket tourism should be taken at the provincial level by public and private sectors for correct, complete, fast, understandable, and up-to-date information.

3. Appropriate tourism quality evaluation standards related to the TCC must also be regulated to assess the quality of tourist attractions. The standards can also be used to minimize the impact of tourist activities and to revive tourism from potential degradation. The restriction of access to natural and cultural attractions of the local people must also be enforced to avoid unnecessary invasions of Phuket tourist attractions.

4. The government should also maintain the concept of a green city and prevent the excessive use of tourism resources. Besides sustainable tourism knowledge and the attitudes of people, tourists and

entrepreneurs must be encouraged to utilize natural resources such as water and energy at the right amount of demand for Phuket tourism to remain sustainable. All recreational activities must be efficient in resource utilization and achieving goals in all TCC indicators.

5. Phuket should strengthen local foundations and develop all local initiatives that have the potential to provide local capital critical to the context of sustainable tourism development. Moreover, "Product-Led Tourism" can be considered as an effective approach to creating a sustainable development tourism cycle (Hunter, 1997).

6. Effective integrated marketing must be encouraged. For example, launching marketing and public relations campaigns on products and services uniquely developed and designed by certain tourist areas to attract tourists and differentiate themselves from other competitive tourism products. The government must consider alternatives critical to the Phuket economy for tourists, and promote strategic tourism areas according to the principles of sustainable tourism and resource utilization.

7. Effective customer relationship management should be established. For instance, classifying a group of tourists whose contacts have been lost according to Customer Lifetime Value, providing more accessibility options in certain tourist areas, offering tourism products and services that are consistent with

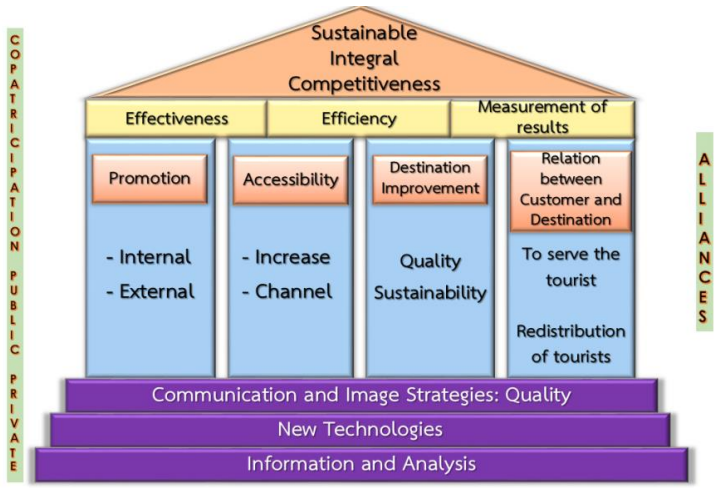

Figure 4. *Sustainable development through "Product-Led Tourism"*

Adapted from "Sustainable tourism as an adaptive paradigm," by C. Hunter, 1997, *Annals of Tourism Research*, 24(4), 850–867 Retrieved from https://www. sciencedirect.com/science/article/abs/pii/S0160738397000364

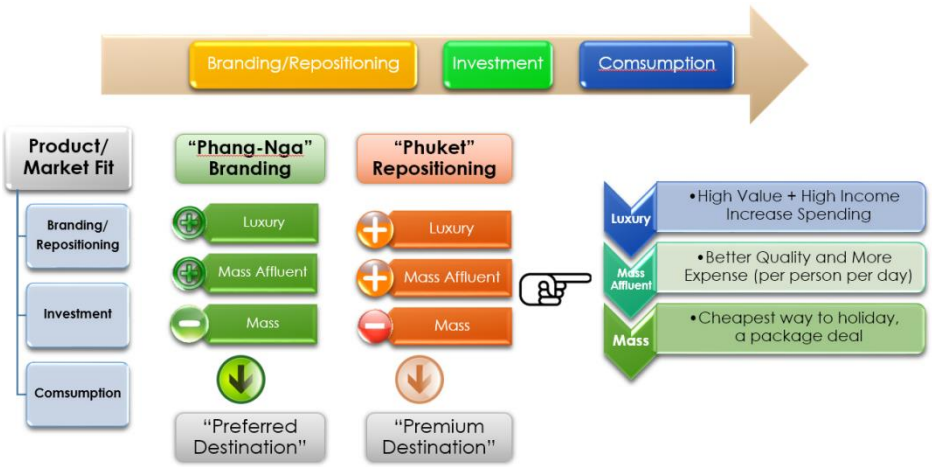

Figure 5. Propose model of management paradigm for Phuket Province

sustainable tourism, and creating remarkable Phuket tourism images to gain a sustainable competitive edge when among other world-class tourist destinations.

8. Phuket Province should add the goods and services that are innovative (innovative travel) and can be associated with a cluster of other potential products that have similarities to other tourism destinations in the Andaman Provinces.

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REFERENCES

Ahn, B., Lee, B. & Shafer, C.S., (2002). Operationalizing sustainability in regional tourism Planning: an application of the

limits of acceptable change framework. *Tourism Management*, 23(1), 1-15.

Audinger, S. (2020). *Phuket Island Map*. Retrieved from http://mapsof.net/_phuket/phuket-island

Badaruddin, M., & Tay, K. X. (2016). A Historical Review of Recreational Carrying Capacity Model (RCC) in Island Tourism. *TEAM Journal of Hospitality and Tourism*, 13(1), 27-39.

Bertocchi, D., Camatti, N., Giove, S., & de Borg. J. v. (2020). Venice and Overtourism: Simulating Sustainable Development Scenarios through a Tourism Carrying Capacity Model. *Sustainability*, 12, 512. Retrieved from http://dx.doi.org/10.3390/su 12020512. www.mdpi.com-/journal/sustainability.

Bimonte, S.,& Punzo, L. F.(2005). Environmental Policy Options in the Multi-regimes Framework. *New Tools of Economic Dynamics*. 297-318. doi:10.1007 /3-540-28444- 3_17

Butler, R.W. (2011). Tourism Area Life Cycle. *Contemporary Tourism Reviews.* Retrieved from https://www.goodfellowpublishers.com/free_files/Contemporary-Tourism-Review-TALC-fa9aef4da56046336b1eef4ef113debc.pdf

Castellani, V., & Serenella, S. (2012). Carrying Capacity of Tourism System: Assessment of Environmental and Management Constraints Towards Sustainability. *Visions for Global Tourism Industry – Creating and Sustaining Competitive Strategies.* 295-316. doi: 10.5772/38750

Chamaiporn Wisetmongkon. (2015). Cruise Tourism and Thai Tourism development. *Tourism Economic review*, 2(October – December 2015), 48 – 61. Retrieved from https://www.mots.go.th/ewt_dl_link.php?nid=7534 (in Thai)

Chamaiporn Wisetmongkon and Uten Nantasen. (2015). ASEAN CONNECT and Tourism Development. *Tourism Economic review*, 2 (October – December 2015), 30-47. Retrieved from https://www.mots.go.th/ewt_dl_link.php?nid= 7534 (in Thai)

Chamberlain K. (1997). Carrying capacity. *UNEP Industry and Environment*, 8, January-June 1997. Paris: UNEP IE.

Coccossis, H., Mexa, A., Collovini, A. (2002). *Defining, Measuring and Evaluating Carrying Capacity in European Tourism Destinations.* Athens: University of the Aegean, Greece

Cronbach, L. J. (1990). *Essentials of psychological testing* (5th ed.). New York: Harper & Row.

Dachanee Emphandhu, Sutas Wattanalert, & Renuka Ruschano. (2004). *Recreational areas Management; Guideline*. Bangkok: Tourism Authority of Thailand. (in Thai)

Decha Bunkam.(1999). Conservation and development. *Academic seminar document on landscape improvement and development*. Bangkok: Brain Media. (in Thai)

Department of National Parks, Wildlife and Plant Conservation. (2006). *Carrying capacity study project of the Erawan National Park in Kanchanaburi Province*. Retrieved from http://park.dnp.go.th/file/Erawan National Park.pdf (in Thai)

Department of Public Works and Town & Country Planning. (2006). *Urban Comprehensive Plan Standards 2006.* Retrieved from http://subsites.dpt.go.th/edocument/images/pdf/sd_urban/std_plan.pdf (in Thai)

Department of Tourism. (2014). *Tourist Attractions Standard: Natural Attractions*. Retrieved from https://www.dot.go.th/ebooks/ebooks-group/41?page=1 (in Thai)

Eber, S. (1992). *Beyond the green horizon: principles for sustainable tourism*. London: WWF UK.

Government Gazette. (2007). Standardsset Sea water quality. *Announcement of the National Environment Board*, 124(11) Retrieved from http://infofile.pcd.go.th/law/3_52_waterpdf?CFID=1457406&CFTOKEN=39910010 (in Thai)

Hof, M., & Lime, D. W. (1997). *Visitor experience and resource protection framework in the National Park System: rationale, current status, and future direction*. Retrieved from https://www.fs.fed.us/rm/pubs_int/int_gtr371/int_gtr371_029_036.pdf

Hunter, C. (1997). Sustainable tourism as an adaptive paradigm. *Annals of Tourism Research*, 24(4), 850–867. Retrieved from https://www.sciencedirect.com/science/article/abs/pii/S0160738397000364

Ioannides, D., & Billing, P. (2005). *Seminar paper on Carrying Capacity for Interreg IIIC "GEDERI"*. Retrieved from: http://www.gederi.org/doc/2/Bonholm/EN%20GEDERI%20Carrying%20Capacity%20-%20Seminar%20Paper.pdf

Kennell, J. (2016). Carrying capacity. *Encyclopedia of Tourism*, 133-135. doi: 10.1007/978-3-319-01384-8_24

Khan, A., Bibi, S., Lorenzo, A., Lyu, J., & Babar, Z. U. (2020). Tourism and Development in Developing Economies: A Policy Implication Perspective. *Sustainability*, 12(4), 1-19.doi: 10.3390/su12041618

Kulya Vanichbancha. (2011). *Statistical Analysis: Statistics for Decision Making.* Bangkok: Chulalongkorn University Press.

Lime, D.W., & Stankey, G.H. (1971). Carrying Capacity: maintaining outdoor recreation quality. *The Forest Recreation symposium proceedings. State University of New York College of Forestry*.

174-184. Retrieved from https://www.nrs.fs.fed.us/pubs /other/recsym/recreation_ symposium_proceedings_174.pdf

Lindberg, K., McCool, S., & Stankey, G. (1997). Rethinking Carrying Capacity. *Annals of Tourism Research,* 24(2), 461–465. doi:10.1016/S0160-7383 (97)80018-7

Marion, JL., & Cole, D.N. (1996). Spatial and temporal variation in Soil and VegetationImpacts on Campsites.*Ecological Applicati ons*, 6(2), 520-530.

McCool, S. F., & Lime, D.W. (2001). Tourism Carrying Capacity: Tempting Fantasy or Useful Reality? *Journal of Sustainable Tourism,* 9(5), 372–388.

National Economic and Social Development Board, Office. (2015). *Gross Regional and Provincial Product Chain Volume Measures 2015 Edition.* Retrieved from http://www.nesdb.go.th.

Noppawan Tanakanjana Phongkhieo, Surachet Chettamart, Dachanee Emphandhu, Nath Pitchakum, Somkiat Singhavorawut, Lek Termtrakul & Siripong Rachkiri. (1998). *Manual for ecotourism facility: Design and Development.*

Office of Strategy Management, Andaman Province Group. (2019). *Tourism in Andaman Province Group*. Retrieved from https://www.osmsouthw.moi.go .th /file-data/ 789554.doc

_____. (2019). *Andaman Province Group Developing Plan 2015 – 2018*. Retrieved from https://www.osmsouth-w.moi.go.th

Official Statistics Registration Systems. (2019). *Population and Household Statistics at the current database*. Retrieved from http://stat.dopa.go.th/ stat/statnew/upstat_ m.php.

Phuket Tourism and Sports Office. (2019). *Tourism A Situation Report in Tourism Development of the South Coast Andaman, 2019*^{P}. Phuket Tourism and Sports Office.

Rodrigue, J.-P. (2020). *The Geography of Transport Systems* (5th ed.). New York: Routledge.

Royal Thai Government Gazette. (2007). *National Environment Board Announcement 27th (2006): Marine and Coastal Water Quality Standard*. Retrieved from http://infofile. pcd.go.th/law/3_52_water.pdf? CFID=1457406&CFTOKEN=3 9910010.124th part 11d

Saveriades, A. (2000). Establishing the social tourism carrying capacity for the tourist resorts of the east coast of the Republic of Cyprus. *Tourism Management*, 21(2),147-156. doi:10.1016/ S0261-5177(99)00044-8

Schneider, B. (1978). Person-Situation Selection: A Review of some ability-situation Interaction research. *Personnel Psychology*, 31(2), 281–297.

Siriphong Pruetthipan. (2008). *Research methods for business*. Bangkok: Hasan Printing.

Standards Development, Department of Public Works and Town and Country Planning Ministry of Interior. (2003). *City Planning Criteria, Social Services Section, Public Parks, Stadiums, Libraries and Museums*.

Stankey, G. H., Cole, D. N., Lucas, R. C., Petersen, M. E., &Frissell, S. S. (1985). *The Limits of Acceptable Change (LAC) System for Wilderness Planning.* Forest Service,United States Department of Agriculture.

Turner, R. (2015). *Travel & Tourism Economic Impact 2015 Caribbean.* Retrieved from: http://www.wttc.org

United World Tourism Organisation/ UNWTO. (1981). *Saturation of Tourist Destinations: Report of the Secretary General.* World Tourism Organisation, Madrid.

Wacharaporn Suriyapiwat. (2010). *Modern Business Research Methodology* (6thed.). Bangkok: Chulalongkorn University Press.

Wagar, J.A.(1974). Recreational carrying capacity reconsidered. *Journal of Forestry*, 72(5), 274–278.

Wang, J., Huang, X., Gong, Z., & Cao, K. (2019). Dynamic assessment of tourism carrying capacity and its impacts on tourism economic growth in urban tourism destinations in China. *Journal of Destination Marketing & Management.* Retrieved from: https://www.elsevier.com/locate/jdmm

Water resources region 10, Bureau. (2019). Southwest Basin. Retrieved from http://water.dwr.go.th/wrro10/index.php/th/ (in Thai)

Widz, M., & Wójcik, T. B. n. (2020). Assessment of the Overtourism Phenomenon Risk in Tunisia in Relation to the Tourism Area Life Cycle Concept. *Sustainability*, 12, 1618; doi:10.3390/su12052004.

World Commission on Environment and Development. (1987). *Report of the World Commission on Environment and Development: Our Common Future*. Retrieved from http://www.environmentandsociety.org/mml/un-world-commission-environment-and-development-ed-report-world-commission-environment-and

World Economic Forum. (2015). *The Travel & Tourism Competitiveness Report 2015.* Retrieved from http://www3.weforum.org/docs/TT15/WEF_Global_Travel&Tourism _Report_2015.pdf

Zacarias, D. A., Williams, A. T., & Newton, A. (2011). Recreation carrying capacity estimations to support beach management at Praia de Faro, Portugal. *AppliedGeography*, 31(3),1075–1081. doi:10.1016/j.apgeog.2011.01.020